REMARKS/ARGUMENTS

Reconsideration is respectfully requested of the Final Official Action of December 18, 2003 relating to the above identified application.

A Request for Continued Examination (RCE) is filed herewith, along with the required fee.

With entry of the foregoing amendment, the claims in the application are 1, 3, 5, 7 to 9, 11 to 16 and 19 to 24. The following comments apply to the new claims, as well.

The rejection of Claims 1, 3, 5, 7 to 9 and 19 under 35 U.S.C. § 103(a) as allegedly obvious in view of *Hirooka, et al.* (US 5,330,813), taken with *Milaniak* (US 5,366,765) is traversed and reconsideration is respectfully requested. It is noted that the Official Action of December 18, 2003, does not contain any reasons explaining this rejection and, therefore, the Official Action is incomplete. Nevertheless, applicants provide the following comments.

As explained in this application (pg. 1, lines 23, et seq.), there is a risk in carburization reactions for the materials to run off in the oven and for the boron compound to vaporize (pg. 2, lines 4-14). The present invention addresses that problem and provides a method and composition for surface hardening of metal surfaces by applying a paste, semi-liquid or liquid substance which forms a boron glass and a magnesium-silicon compound in a certain weight ratio.

The basic idea of *Hirooka* is the formulation of a protective coating in the form of a patch for many different types of hardening processes. The "patch-idea" proposed by *Hirooka* is for use under a myriad of conditions including nitriding, carburizing and oxidizing processes. All

these processes have absolutely different atmospheres (reducing, oxidizing, nitrogen and carbon emitting atmospheres) and process temperatures and it is not shown that the compositions given in the patent are suitable under any and every imaginable process condition. Thus, *Hirooka* has catalogued any and all technically available kind of oxide materials for use in the composition of their patches. *Hirooka*'s list of oxides is very unspecific as to which process they are intended for. It is indisputable that zinc oxides, alumina, zirconia, titanium oxide and all the other oxides cited in *Hirooka* are helpful additives in protective compositions. This is known from other patents and literature about protective coatings; but, specific properties or specific actions of the large number of different oxides cited in *Hirooka* are not given anywhere in the citation.

Therefore, specific properties such as a flow preventive effect or an effect on the temperature of evaporation of the applied composition cannot be deduced from this patent.

Hirooka discloses forming a patch for preventing carburization and hence would not have faced the problems addressed by applicants in this application (see pgs. 1 and 2). *Hirooka* contains no hint of how to deal with the problem of high evaporation rates of boron oxide or borate which in turn causes problems such as decreasing the lifetime of ceramic linings and heating elements. There is no disclosure in *Hirooka* of any existence of problems of high evaporation rates when following the teachings of that reference. Hence, as *Hirooka* observed no excessive evaporation or vapor pressure, there would be no reason or motivation to switch from one additive to another for the application of a substance capable of forming boron glass.

Hirooka fails to teach any solution to the problems discussed in this application and, in particular, fails to recognize the problem of evaporation of boron compound. Clearly, *Hirooka*

fails to teach that a select group of magnesium silicon compounds offers a solution to this problem.

This can also be seen from the examples given. There are eight examples given, six of which are focused on carburization, one on nitriding (ex. 6) and one on oxidizing (ex. 7). Within the carburizing examples, the only additives mentioned are:

1. boron oxide, no additive oxide
2. boron oxide, titanium oxide
3. sodium borate (borax), phenyl boric acid
4. sodium borate (borax), phenyl boric acid (same as ex. 3)
5. boron oxide, titanium oxide and Aerosil (a special kind of silica)
8. boron oxide and iron oxide.

6. n.a. nitriding / tin powder
7. n.a. oxidizing / boron oxide, titanium oxide, borosilicate (glass)

All the other oxides cited by *Hirooka* are not used in any examples and one is left to speculate as to which oxide can be used in what process! Specific properties of oxide additives cannot be detected from the examples or the description.

Hirooka is totally silent on the problem of known hardening protection compositions based on substances which form boron glass having the tendency of running off in the oven during the hardening operation. This is particularly a problem after incomplete drying or due to binding of moisture from the atmosphere by the composition since the viscosity of the boron compounds is greatly reduced by water at a high temperature. Moreover, at carburization temperatures of 900° to 980°C the boron compound can vaporize until vapor pressure

equilibrium is established. If this occurs, there results a decrease in the protective action due to the protective layer becoming thinner. Moreover, the oven lining, which contains silica containing bricks, and furnace equipment can also be attacked under those conditions.

The present applicants, faced with these problems in the industry, sought for a way to improve the situation. Applicants have focused mainly on the low pressure gas carburization process of steel, a process which in recent years is more and more important in the industry. This process is a particular one and faces some special problems when protective coatings are used. Here, the steel parts are carburized at temperatures between 800 and 1000°C under a vacuum of 1 – 200 mbar (approx.).

For use in these processes, protective coatings must be selected very carefully, and, of special importance, the evaporization of boron oxides or borates or other oxides from protective coatings must be prevented, as such oxides would deposit on the internal heating elements or on the ceramic limiting of the furnaces, thus destroying these elements by corrosive attack. Also, the evaporation and re-deposition of boron oxide or borate on different parts of the treated surfaces must be prevented.

Thus, it was surprisingly found that the addition of magnesium-silicon compounds to the hardening protection compounds of the present invention would reduce the risk of running off of the treating material and reduce the vapor pressure which in turn reduces the risk of attack on the oven lining. This solution to the above-described problem is not even hinted at by *Hirooka*.

It was the outstanding discovery by applicants that magnesium silicates, especially in the form of magnesium trisilicate, are materials which decrease the evaporation temperature of

boron oxides or borates such that the rate of evaporation under low pressure is sufficiently low so that these compounds (boron oxides or borates) can be used as protective coatings in such low pressure gas carburizing. Apart from this, it was found that these boron oxide – Mg-trisilikate compositions, of course, can also be used successfully in standard gas carburizing atmospheres. In such atmospheres, they also exhibit the effect of low evaporation rates and lead to an increased lifetime of ceramic linings and heating elements, as well as a reduced flow effect on the parts.

Hirooka does not disclose the use of paste-like or lacquer-like materials containing magnesium-silicon compounds. Only patches are shown and *Hirooka* does not teach the interchangeability of applicants' magnesium-silicon compounds with patches containing other oxides. Furthermore, the problems discussed above are not addressed in the *Hirooka* patent. Therefore, persons skilled in the art faced with those problems would not be lead to find a solution by reading the *Hirooka* patent.

The *Milaniak* patent teaches the use of a slurry for coating super alloy surfaces. However, the patent is limited to coating super alloy surfaces with an aluminum coating termed an "aluminide protective-coating." These coatings of *Milaniak* are for protection against heating-gas corrosion and heating gas oxidation; see col. 1, lines 16-21. Thus, the teaching of a slurry to apply an aluminum coating for protection against corrosion and oxidation would not suggest the application of a paste, semi-liquid or liquid of a boron glass together with a magnesium-silicon compound which unexpectedly results in reducing running off of the material when coated on a

metallic surface in a carburization process. No equivalence or interchangeability has been established in the Office Action as to the aluminide coating and carburization.

Milaniak does not disclose using boron oxide or borate used for building up the protective coatings or metallic surfaces. Hence, the problems facing workers in this field as discussed on pages 1 and 2 of this application; namely, high evaporation rates of such materials causing the decreasing lifetime of ceramic linings of furnaces and heating elements are not discussed and, therefore, person skilled in the art seeking solutions to these problems would find no useful information in *Milaniak.*

Therefore, it is apparent that there is a lack of motivation in the Examiner's combination of references, and, consequently, a person skilled in the art would find no reason, suggestion or motivation to combine the two references to arrive at applicants' invention. Accordingly, it is respectfully submitted that the rejection is improper and should be withdrawn.

Claims 1, 3, 4, 7 to 9 and 11 to 13 were rejected as unpatentable over *Hirooka*, in view of *Milaniak* in the Official Action of July 11, 2003, which is incorporated by reference in the final action of December 18, 2003. The Official Action of July 11, 2003, alleged that *Hirooka* disclosed the invention substantially as claimed and the Official Action pointed to the disclosure of the patch for preventing carburization. The Official Action alleges that it would have been obvious to select a substance which formed boron glass and a particulate material such as magnesium silicon compound as the adjuvant in order to obtain an anti-carburizing coating. Although the Office Action referred to "talc", the *Hirooka* references refers to "zinc oxide talc" which would suggest the inventors were referring to a zinc modified silicate, not talc itself. The

Official Action goes on to admit that *Hirooka* does not disclose the use of a paste, semi-liquid or liquid and relies on *Milaniak* to show a slurry applied to a metallic surface. The Official Action concludes that the patch and the slurry of *Milaniak* are equivalent simply because they are applied to a metallic surface. Applicants wish to note that there is no basis whatsoever for the conclusion as to the equivalence or interchangeability of the patch of *Hirooka* and the slurry of *Milaniak.*

In the first place, the coating system of *Milaniak* has not been shown to be the equivalent of the coating system used in a carburization method. No disclosure is found in either reference which would lead a person skilled in the art to presume that the same criteria are necessary to obtain a coating in each case, nor that the problems faced in producing a coating for carburization and a coating for the aluminide protective coating would be the same. Applicants have pointed out that when using a paste, semi-liquid or liquid, there is encountered the problem of high evaporation of such materials which causes problems in connection with the ceramic lining of the furnace and the heating elements contained therein. Such is not a problem with using the patches of *Hirooka* which do not have that same high evaporation problem.

Neither is there anything in the *Milaniak* patent which would lead a person skilled in the art to believe that there was any benefit or advantage to be obtained if a slurry is substituted for the patch of *Hirooka*. Consequently, applicants respectfully submit that in the absence of any reason, suggestion or motivation for a person skilled in the art to select a magnesium-silicon compound for use in a paste, semi-liquid or liquid with a boron compound in place of the patch,

the combination of references relied on by the Examiner to reject the claims is improper and should be withdrawn.

With regard to the rejection of Claims 3, 5 and 7, it should be noted that these claims are all dependent on Claim 1 and, therefore, the subject matter as a whole would not have been obvious to a person having ordinary skill in the art for the reasons set forth above in connection with Claim 1. Those arguments are relied on herein as well.

Furthermore, Claim 9 incorporates all the limitations and features of Claim 1 and, therefore, would not be rendered obvious for the same reasons as set forth in connection with Claim 1.

In summary, a person skilled in the art faced with the problems of a high evaporation rate and excessive attack on the ceramic linings and heating elements contained in the furnace would have found no suggestion in either *Hirooka* or *Milaniak*, either individually or combined, which would have lead that person skilled in the art to a composition containing a substance which forms a boron glass and a magnesium-silicon compound in the form of a paste, semi-liquid or liquid to provide a hardening protection composition for use in the carburization of a metallic component.

In view thereof, applicants respectfully submit that the rejection of Claims 1, 3, 7 and 9, as allegedly obvious, is not well considered and should be withdrawn.

The rejection of Claims 14 to 16 and 20, under 35 U.S.C. § 103(a) in view of *Hirooka* is traversed and reconsideration is respectfully requested. The remarks made above apply to the process claims as well. *Hirooka* simply does not suggest the combination of elements set forth

in the rejected claims. The cited prior art is lacking in any suggestion that pastes, semi-liquids, or liquids containing the boron compound and the magnesium-silicon compound would bring about an improvement relative to the problems discussed in this application.

There is no reason, suggestion or motivation in the *Hirooka* patent to form a liquid, semi-liquid or paste having the proportions and the characteristics set forth in the present invention. Furthermore, there is no suggestion that any benefit or advantage could be obtained thereby. Consequently, the rejection on the ground of obviousness is not well founded and should be withdrawn.

To establish a *prima facie* obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter,* 458 F.2d 1013, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine,* 837 F2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones,* 958 F2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills,* 916837 F2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

A statement that the modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood,* 28 USPQ 2d, 1300 (Bd. Pat. App. & Int. 1993).

New Claims 23 and 24 are directed to more specific aspects of the invention such as mentioned on page 5, lines 1-10; i.e., vacuum carburization. Claims 21 and 22 more particularly point out the advantages of the present invention in reducing run off and reducing vapor pressure.

Arguments in support of patentability discussed above apply to the new claims with equal emphasis.

In view thereof, it is respectfully requested that the rejections be withdrawn and that the application be allowed at the Examiner's earliest convenience.

Respectfully submitted,

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